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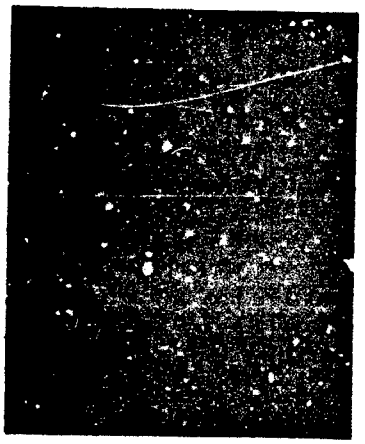

Technical Report

AD 640 119

MECHANIZATION STUDY OF THE TECHNICAL LIBRARY U.S. NAVAL WEAPONS LABORATORY DAHLGREN, VIRGINIA

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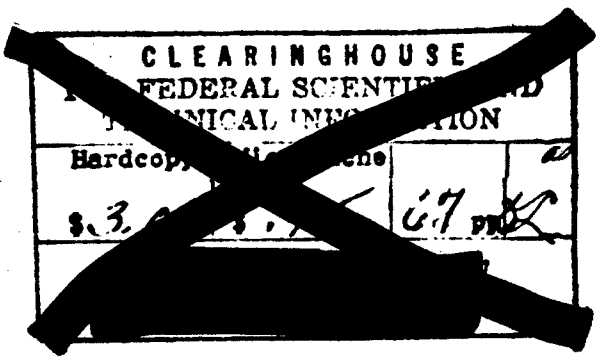

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Technical Report

AD 640 119

MECHANIZATION STUDY OF THE TECHNICAL LIBRARY U.S. NAVAL WEAPONS LABORATORY DAHLGREN, VIRGINIA

Submitted to

Defense Supply Agency
Defense Documentation Center
Cameron Station, Virginia

by

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Bethesda, Maryland 20014

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ABSTRACT

The Naval Weapons Laboratory (NWL) Technical Library is redeveloping a mechanized system that used the IBM 7090 and 1401 computers for the IBM 870 Document Writing System and the IBM 7030 computer (STRETCH). Mechanized processes in the IBM 7090 System provide for the establishment and maintenance of a master file for reports and the search of this file to satisfy requests from Library users. The 870, 7030 System is expected to increase the timeliness of accession bulletins and catalog cards, increase the efficiency of Library procedures (Descriptive cataloging, typing, and keypunch are combined into one step), and give the Library more control over procedures (e.g., punched cards instead of worksheets will be sent to computer operations, and generation of accessions bulletins and catalog cards will no longer involve computer operations).

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A P P E N D I C E S

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I. SUMMARY

The Technical Library at the Naval Weapons Laboratory (NWL) began its mechanization program using the IBM 7090 and IBM 1401 computers at NWL's Computation and Analysis Laboratory (K Lab). The purpose of mechanization was threefold:

- To permit greater depths of subject indexing of publications received by the Technical Library. Formerly, because of the manual system, only three or four subject headings were assigned to each publication. In the mechanized system, a typical document has 10 to 15 subject headings (descriptors) assigned.

- To permit a more rapid and timely search of the publications contained in the Technical Library file. Because of the increased depth of the subject indexing, a search may be more specific than was possible in the past. For instance, an engineer may ask for a listing of all documents published since 1961 pertaining to target detection devices used in the proximity fuze of the Terrier Missile Warhead.

- To prepare a weekly listing (NWL Technical Library Bulletin) of all new publications received by the Technical Library during the previous week. The format of this listing is such that it can be cut into 3 x 5 sheets and used for filing by the Technical Library.

The Library is currently redeveloping the mechanized system for the IBM 870 Document Writing System, the IBM 1401 computer, and the IBM 7030 computer. (STRETCH)* (The 1401 will eventually

* The 7030 programmer is Ty Richmond of the Computation and Analysis Laboratory at NWL.

be replaced by the IBM 360.) In the new system, an increased level of mechanization will be attained, particularly in the simplification of Library staff operations. (For organization of the Library and its activities, see Appendix A.)

The purposes of the new system will be:

- To change documentation procedures for faster circulation of documents.
- To enable the Library to punch its own cards, print an accessions bulletin, and automatically type its own supporting catalog cards.
- To use punched cards (instead of worksheets) to be forwarded to the K Lab for entering on magnetic tape and input into the computer storage of document subject matter.
- To use a thesaurus of natural language descriptors.
- To punch periodical cards for participation in the Applied Physics Laboratory Union List of serials.
- To print book catalog cards, overdue notices, and a Book Section accessions bulletin.
- To provide a periodical inventory.
- To provide rapid and timely search of the publications in the Library file, eventually using remote console to type in literature-search questions and to receive immediate answers.
- To provide a printed book catalog, with supplement to be cumulated monthly, making only two books to consult. Copies

will be distributed throughout the Laboratory, which will enable patrons to avoid fruitless trips to the Library if the material is not held there.

The IBM 7030 will be involved only in the satisfaction of the last two purposes. The other purposes will require only the IBM 870 The major reason for the switch from the IBM 7090 to the IBM 7030 is the decreasing availability of the IBM 7090 at NWL.

The Technical Library supports NWL's mission of R&D and provides operations support in astronautics, geoballistics, external ballistics, digital systems, operations analysis, computer science, and warfare analysis. To support this mission, the Library has a collection of 16,000 books, with a growth of 2,000 per year; 45,000 Unclassified and Confidential reports and 15,000 Secret reports, with a growh of 8,500 annually; and 600 periodical subscriptions, with an annual increase of between 25 and 50 titles.

The Library serves NWL's 2,000 personnel, with the majority of its uers being the scientists and engineers engaged in research and development work. The Library maintains interlibrary loan arrangements to provide required books and periodicals not in the collection Service is provided to other government and military libraries and their contractors. Accessions lists, periodicals, and documents are routed primarily to the technical staff personnel. Similarly, the major requests for specific items and bibliographies come from the

technical staff, most often by phone or memo, but in many cases in person. Request forms are not completed by the requesters but rather by the Library staff.

II. MECHANIZATION

1. CHRONOLOGY

In March 1962, a storage and retrieval program was begun on the IBM 7090.

In the summer of 1963 the Missile Safety Information Center Program was incorporated with the computer program.

In June 1964, the IBM 870 Document Writing System was ordered.

In October 1964, the Technical Library moved to new, enlarged quarters. As a result of this move, the following changes were made:

- Reference and literature searching services have increased in the Book and Document Sections.
- Open literature searching materials are now housed in one reading room, and the collection is being developed and enlarged.
- A Branch Library has been established in the K Lab, staffed by the Technical Library.

In March 1965, the Microfiche Program was carried out, as follows:

- Fourteen portable readers were placed throughout the Laboratory.
- A reader/printer has been placed in the Document Reading Section. (Portable reader/printers will be purchased next.)

- Microfiche is now received from DDC, National Aeronautics and Space Administration (NASA), and Atomic Energy Commission (AEC). (Response by users has been excellent. Requests tripled in one month for microfiche copies.)

- A KALVAR microfiche sheet copier has been installed. Copies are circulated on an expendable basis.

In May 1965, the IBM 870 was installed and in use. The Visual Search Microfilm File (VSMF) System of vendors' catalogs, specifications, and handbooks, on microfilm cartridges with a reader/printer, was ordered. Also in May, a permuted index of NWL internal reports and memos was being compiled, and staff service to the Branch Library was increased in the Warhead and Terminal Ballistics Laboratory.

By the spring of 1967, a remote console connected with the IBM 7030 in the K Lab will be able to type in questions for literature search and receive immediate answer.

2. DESCRIPTION OF PROCESSES--IBM 7090 SYSTEM

Mechanized processes in the IBM 7090 System are limited to the establishment and maintenance of the Master File for reports and the search of this file to satisfy requests from Library users.

(1) Thesaurus

A computer printout of descriptors and descriptor codes is made as required. Originally based on Naval Ordnance

Laboratory's four-to-six-letter codes, the listing contains 2,500 to 3,000 descriptors and approximately 3,000 identifiers. No attempt at usage analysis is made on the computer; new terms are held out until they can be reviewed to determine their potential importance. Inputs are run against the thesaurus and the master tape to detect errors.

(2) Master File Establishment and Maintenance Processes

Library Document Indexing Worksheets (See Appendix B-1) are prepared for each report by the Technical Library staff. The data from these worksheets are keypunched onto IBM cards (see Appendix B-2) and are subsequently transcribed onto magnetic tape which is used as input to the file maintenance programs. (See Appendix B-3 for computer operating procedures for file establishment and maintenance.)

A worksheet is prepared for each document to be entered in the Master File, and a unique accessions number is assigned to each document. The worksheet was designed to simulate IBM cards, for ease in keypunching, with a maximum of 10 cards per worksheet. These cards are numbered by card codes and contain information as follows:

Card Code	Data
1 and 2	Source abbreviation, report number, and source

Card Code	Data
3, 4, and 5	Title
6	Author, date of publication, security classification, number of copies, routine and miscellaneous information
7	Auxiliary number and contract number
8	Descriptor codes.

There may be up to three type 8 cards, a maximum of 35 descriptor codes being allowed per document.

For a document to be accepted into the master file, the document must have, as a minimum, the following information:

type 1 card--source

type 3 card--title

type 6 card--author, date, etc.

type 8 card--descriptor codes.

Transaction codes are used to determine the type of processing to be performed on the input data--entry, deletion, or change. The first, entry--denoted by the code E for card types 1 through 7 and by codes X, Y, and Z used respectively with the three type 8 cards--is used only when entering a document in the master file. Deletion (code D) may be used either to delete an entire document from the file or to delete a descriptor code or codes belonging to a document. The last transaction, change,

is signified by the code R and is used to alter a portion of the data pertaining to a document which is in the file.

Transaction codes and their usage are as follows:

Code	Usage
E (For use with card types 1 - 7	Only when entering a document for the first time
X (For use with Y type 8 Z cards)	
D	For deletions: 1. To delete a descriptor, enter: Card code (col. 1)--type 8 Transaction code (col. 2)--D Accession number of document (col. 3-8) Descriptor(s) to be deleted 2. To delete an entire document, enter: Card code (col. 1)--type 1 Transaction code (col. 2)--D Accession number of document to be deleted (col. 3-8)
R	For replacement: 1. To replace a descriptor that has been deleted or to add a descriptor if there is a space, enter: Card code (col. 1)--type 3 Transaction code (col. 2)--R Accession number (col. 3-8) Descriptor(s)

Code (Cont'd)	Usage
R	2. To replace or add an item other than a descriptor: Enter the item to be added or changed in its position on the proper card (e.g., a date goes on a type 6 card, contract number on a type 7 card), with transaction code R and all other previously entered data belonging to that card.

(3) Library Processes

For flow chart of library processes, see Figure 1.

1. Reports are received and are separated by requested items and items received on distribution.

2. Requested items are sent to Acquisitions Library where name of requester and route sheet are attached.

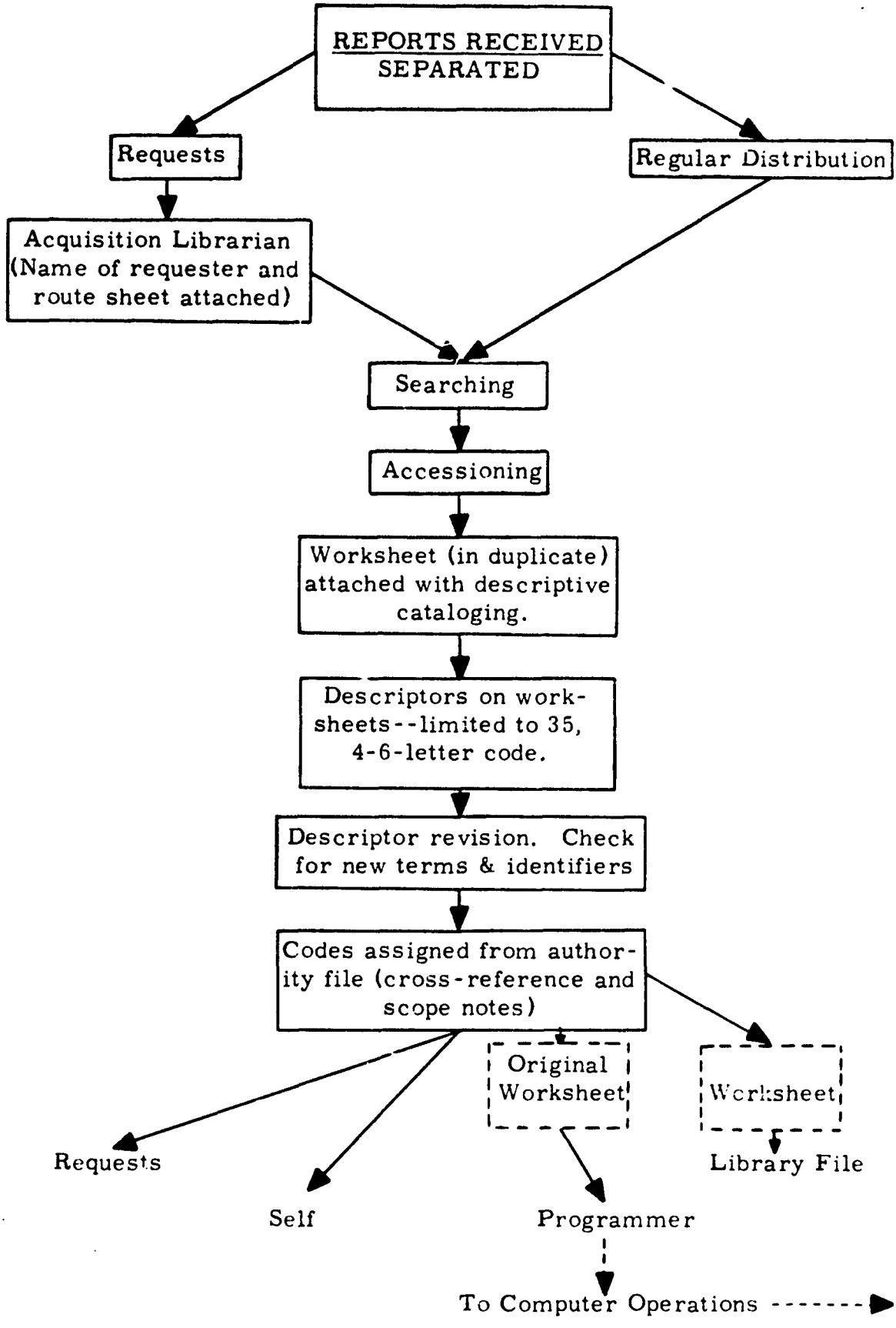
3. Both requested items and those received on distribution are checked for duplication.

4. Accession numbers are added.

5. Worksheets (see Appendix B-1) are prepared in duplicate, including descriptive cataloging information (source abbreviation, report number, source, title, author, date, classification, copy number, routing,

FIGURE 1

Library Procedures--IBM 7090 System



additional numbers, contract number) and descriptors.

6. Descriptors are revised, checking for new terms and identifiers.

7. Descriptor codes are assigned, using the four-to six-letter code from the Dictionary of Codes in Use with Descriptors which includes cross-reference and scope notes. (For sample page from Dictionary, see Appendix B-4).

8. Reports are sent to the requester or shelved, as appropriate.

9. Original worksheet goes to the programmer and then to computer operations; the duplicate, to Library files.

The Technical Library Bulletin is produced as an optional byproduct by a subroutine of the file maintenance program and is divided into (1) a classified report which contains all new documents which have a security classification of Confidential or greater, and (2) an unclassified report of new documents that are not classified. The format of the report is such that, in addition to the regular distribution of the Bulletin, heavy paper copies can be printed and cut to 3 x 5 catalog cards for the Library. (See Appendix B-5 for sample page from the Technical Library Bulletin.)

(4) Search Processes

The search program scans the master file for documents which satisfy search questions prepared by the Technical Library staff from requests made by station personnel. These questions are punched onto IBM cards (see Appendix C-1) and transcribed onto magnetic tape which is used as input to the computer runs. (See Appendix C-2 for computer operating procedures for search.) The program is set up to allow for a maximum of 99 questions for any one search run.

A question may have a maximum of nine descriptor codes and three special codes which are used to select documents according to the year of publication and on the basis of security classification. A search is made by matching the descriptor codes of each question against the documents' descriptor codes, by matching the first two special codes of the questions against the year portion of the documents' dates of publication, and by selecting only unclassified documents if the last special code of a question is used. When a document record is found which satisfies a question, the record is reserved for later listing.

Use of the Library Search Question. Questions are identified by a "question number" which occupies columns 1 through 6 of the input card. The number of descriptor codes used in a

question is punched in columns 7 and 8. The remainder of the input card is divided into six-digit fields to provide for the nine descriptor codes and the three special codes. Keypunching procedures are as follows:

Column	Data
1-6	Question number -- Should be right-adjusted and filled in with zeros at left.
7-8	Number of descriptors in the question -- must be right-adjusted.
9-62	Descriptors -- There can be up to nine. The first descriptor goes in columns 9-14, the second in columns 15-20, the third in columns 21-26, etc. For example, if the first descriptor is "WARF," then WARF goes in columns 9-12, and columns 13 and 14 will be blank. Descriptors must be left-adjusted.
63-68	To be used to select documents according to the year of publication. To select all documents published during and after a certain year, enter that year in columns 65-66 and leave 63, 64, 67 and 68 blank.
69-74	To select documents published before a certain year, enter that year in columns 71-72 and leave columns 69, 70, 73, and 74 blank.
75-80	To select only unclassified documents, enter "UNCLAS" in columns 75-80. If all information (i.e., classified and unclassified) is desired, leave these columns blank.

3. DESCRIPTION OF PROCESSES - IBM 870, 7030 SYSTEM

The major reason for the switch to the IBM 7030 is the decreasing availability of the IBM 7090. The major purposes of the IBM 870 Document Writing System are: (1) to increase the timeliness of accession bulletins and catalog cards; (2) to increase the efficiency of Library procedures--descriptive cataloging, typing, and keypunch are combined into one step; and (3) to give the Library more control over the procedures--e.g., punched cards instead of worksheets will be sent to computer operations, and generation of accessions bulletins and catalog cards will no longer involve computer operations.

At present, cards have been keypunched to convert the coded descriptors now in file to the natural language which will be used in the system. The new system began operation in the fall of 1965.

An overall comparison of the old and new system follows:

Accessions Bulletin and Catalog Cards. In the 7090 system, an accessions listing is printed by the computer in 3 x 5 card format. These accessions listings are routed to users who can maintain the reference either in the accessions listing format or cut into 3 x 5 cards for their own file. Items desired from the listing are marked, and bulletins are returned to the Library for processing of the request. Catalog cards are printed on card stock from the computer printout. The same card format serves as catalog card entry, accessions

listing entry, and entry on printout from a search of the computer files. Using the new IBM 870 system, a Daily Accessions Bulletin will be printed on duplimat and sent to the Printing Department for the desired number of copies. The IBM 870 will be used to print catalog cards daily, allowing the cards to be filed much faster. Accessions bulletins and catalog cards will no longer include descriptors.

Master File Establishment and Maintenance. Under the 7090 system, worksheets are prepared by the Technical Library and are keypunched at computer operations. Descriptors have four-to six-letter codes. The initial entry for the document must include descriptors.

In the new system, the Library provides punched cards. Descriptors are in natural language. The initial entry for the document need not include descriptors.

Search. Under the 7090 system, worksheets are prepared by the Technical Library and are keypunched at computer operations. Descriptors have four-to six-letter codes. Outputs are provided in 3 x 5 card format. Only the AND relationship is permissible among descriptors in the query.

In the new system, the Library provides punched cards. Descriptors are in natural language. Outputs will include an abstract along with the descriptive or bibliographic data for each entry on the

printout. The printout will provide a regular listing of entries rather than a 3 x 5 card formatted listing. Both AND and OR relationships are permissible among descriptors in the query.

Thesaurus. In the new system, the four-to six-letter codes will be eliminated.

A description of the new 870, 7030 system follows.

(1) Master File Establishment and Maintenance Processes

Punched cards for each document are prepared by the Technical Library staff. (See Appendix D-1 for format for producing cards.) These cards are transcribed onto magnetic tape which is used as input to the file maintenance program.

There are eight card types used to describe each document, as follows:

Card Type	Data
1	Up to seven descriptors per card; each descriptor requiring 1 - 10 characters; maximum number of cards, 100.
2	Up to three descriptors per card; each descriptor requiring 11 - 20 characters; maximum number of cards, 100.
3	One descriptor per card, requiring 21 - 40 characters; maximum number of cards, 100.
4	Source; maximum number of cards, 100.
5	Title; maximum number of cards, 100.
6	Abstract; maximum number of cards, 100.

Card Type	Data
7	Auxiliary number, contract number.
8	Author, date, classification.

Entries into all data fields are left-justified. Columns 1-10 for each card contain card type, card number within type (00-99), transaction code, and accession number.

For a document to be accepted into the Master File, the document must have, as a minimum, the following information:

type 4 card--source

type 5 card--title

type 8 card--author, date, classification

Transaction codes are used to determine the type of processing to be performed on the input data--enter, delete, or replace.

Enter--transaction code E is used for the initial entry of a document into the file and later to enter new information about the document, the new information being limited to card types 1, 2, 3, 6, and 7.

Delete--transaction code D may be used to delete an entire document from the file or to delete type 1, 2, 3, 6, and 7 information belonging to the document.

Replace--transaction code R may be used to replace

particular information belonging to a document with new information. Replacement is done on a card-type basis, e.g., if information is to be replaced on one type 1 card, all type 1 cards must be replaced.

(2) Library Processes

For flow chart of Library processes, see Figure 2.

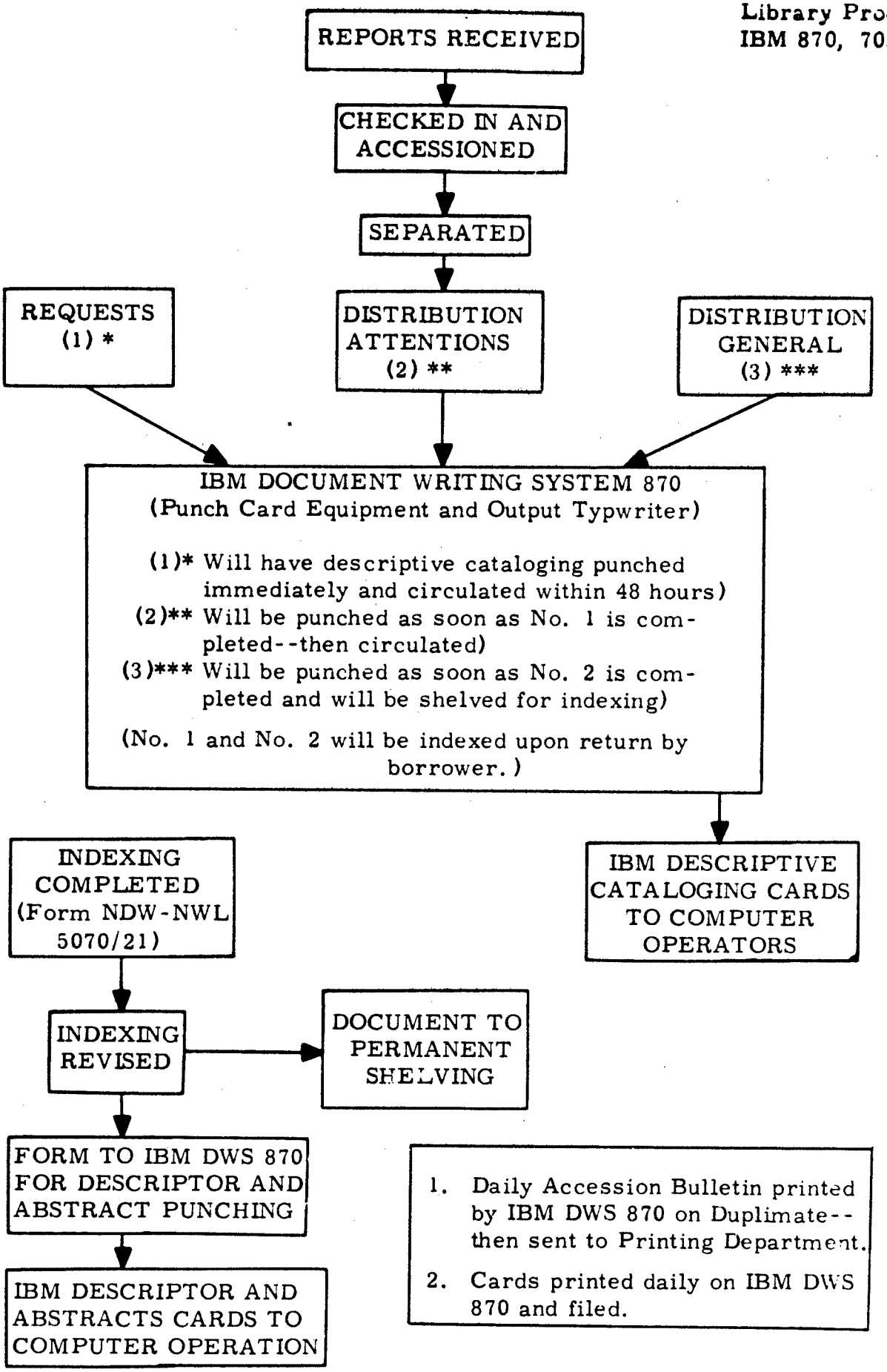
1. Incoming reports will be checked and accessioned.

2. Reports will be separated first by requested items, then by items received on general distribution or items received on distribution but marked for an individual's attention.

3. The IBM 870 Document Writing System will be used in the following ways:

- Descriptive cataloging will be punched immediately on requested items (items to be circulated within 48 hours of receipt). Indexing on these items will be completed upon their return.
- Items received on distribution for an individual's attention will be keypunched next and then circulated. Indexing will be completed upon the return of these items to the Library.
- Items received on general distribution will be keypunched and shelved for indexing.

4. Accessions Bulletin and Catalog Cards will be prepared, and punched cards containing descriptive information


REPORTS RECEIVED
CHECKED IN AND ACCESSIONED
SEPARATED
REQUESTS (1) *
DISTRIBUTION ATTENTIONS (2) **
DISTRIBUTION GENERAL (3) ***
IBM DOCUMENT WRITING SYSTEM 870
(Punch Card Equipment and Output Typwriter)
(1)* Will have descriptive cataloging punched immediately and circulated within 48 hours)
(2)** Will be punched as soon as No. 1 is completed--then circulated)
(3)*** Will be punched as soon as No. 2 is completed and will be shelved for indexing)
(No. 1 and No. 2 will be indexed upon return by borrower.)
INDEXING COMPLETED (Form NDW-NWL 5070/21)
IBM DESCRIPTIVE CATALOGING CARDS TO COMPUTER OPERATORS
INDEXING REVISED
DOCUMENT TO PERMANENT SHELVING
FORM TO IBM DWS 870 FOR DESCRIPTOR AND ABSTRACT PUNCHING
IBM DESCRIPTOR AND ABSTRACTS CARDS TO COMPUTER OPERATION
1. Daily Accession Bulletin printed by IBM DWS 870 on Duplimate--then sent to Printing Department.
2. Cards printed daily on IBM DWS 870 and filed.

will be sent to computer operations.

5. Indexing will be completed on general distribution items and others as returned. Input form NDW-NWL 5070/21 will be completed with addition of accession number and descriptors. (For sample of form, see Appendix D-2.) Descriptors will be grouped on the input form by number of letters, either 10, 20, or 40. Between 10 and 15 index terms are assigned per document. Descriptors will be assigned from the same thesaurus as used in the old system, though a new printout of the terms, without the four-to six-letter codes, will be used.

6. Indexing will be revised.

7. Documents will be shelved.

8. Input form will go to the IBM 870 operator for descriptor and abstract punching. The abstract will be taken as nearly as possible from the one included in the report, with a limit of 700 words. Descriptors and abstract cards will go to computer operations.

9. Descriptive cataloging punched cards will be returned from the computer operation and will be filed in the Library as the accession or shelf list card.

(3) Search Processes

Requester or the Library staff will complete the Literature Search Request form. (For sample of completed form, see Appendix E-1). This form will be sent to computer operations, where the cards will be punched.

Punched cards for each question will be prepared by the Technical Library staff. These cards will be transcribed onto magnetic tape which will be used as input to the search program.

The search program is restricted to 99 questions per setup, with a maximum of three cards per question. The card format for each card of a question follows:

Column	Data
1 - 2	Question number
3	Type descriptor (either 1, 2, or 3)--Where: 1, 0-10; 2, 11-20; 3, 21-40.
4	Number of cards making up question (1, 2, or 3).
5	AND/OR key (should be punched a 1 or left blank; see below).
6 - 75	Descriptors--All descriptors must be of same type as indicated in column 3.
76 - 77	To be used to select documents according to the year of publication. To select all documents published during and after a certain year, enter that year in columns 76 and 77. (Leave 78 and 79 blank if these fields are punched).
78 - 79	Blank

Column	Data
80	To be used to select only unclassified documents. Punch a 1 in column 80. Leave blank if both classified and unclassified documents are desired.

The descriptors on any one card are AND related and must all be of the same type. The AND/OR key is punched according to the desired relationship between cards:

Condition	AND/OR Keypunching* Card 1	Card 2	Card 3
One card only	0	-	-
(Card 1) AND (Card 2)	1	1	-
(Card 1) OR (Card 2)	0	0	-
(Card 1) AND (Card 2) AND (Card 3)	1	1	1
((Card 1) AND (Card 2)) OR ((Card 1) AND (Card 3))	1	1	0
((Card 1) OR (Card 2) OR (Card 3)	0	0	0
((Card 1) AND (Card 2)) OR (Card 3)	1	1	0

A sample of the results of a search appears in Appendix E-2.

(4) Book Catalog Generation Processes

Now under development, the book program will use the IBM 870 Document Writing System as input to the computer program for producing a Book Catalog Handbook. The old catalog will not be converted to punched cards. Three-by-five cards

*A Zero (0) means leave blank; a dash (-) means not applicable.

will not be made on new items; accession lists will not be used until the first issue of the Book Catalog Handbook is issued.

1. Input Procedures

For flow chart of Book Catalog Generation input procedures, see Figure 3.

(1) Book is selected from Publisher's Weekly or some other selection tool. When item is requested by user, entry is located in one of the selection tools whenever possible.

(2) Entry for the item selected is used to punch card for ordering, cataloging, borrowers' cards, overdue cards, and accessions bulletin.

(3) Cutter number is adjusted before giving Publisher's Weekly to keypunch operator.

(4) Master IBM card is keypunched, and a borrower's card is keypunched at the same time. As the data are being keypunched for ordering, they are being printed on 3 x 5 cards on the output typewriter. The printout will supply the jobber's order, the supply record, and the Library record. Subject headings are included on the master punched card but are suppressed on the carbon copies.

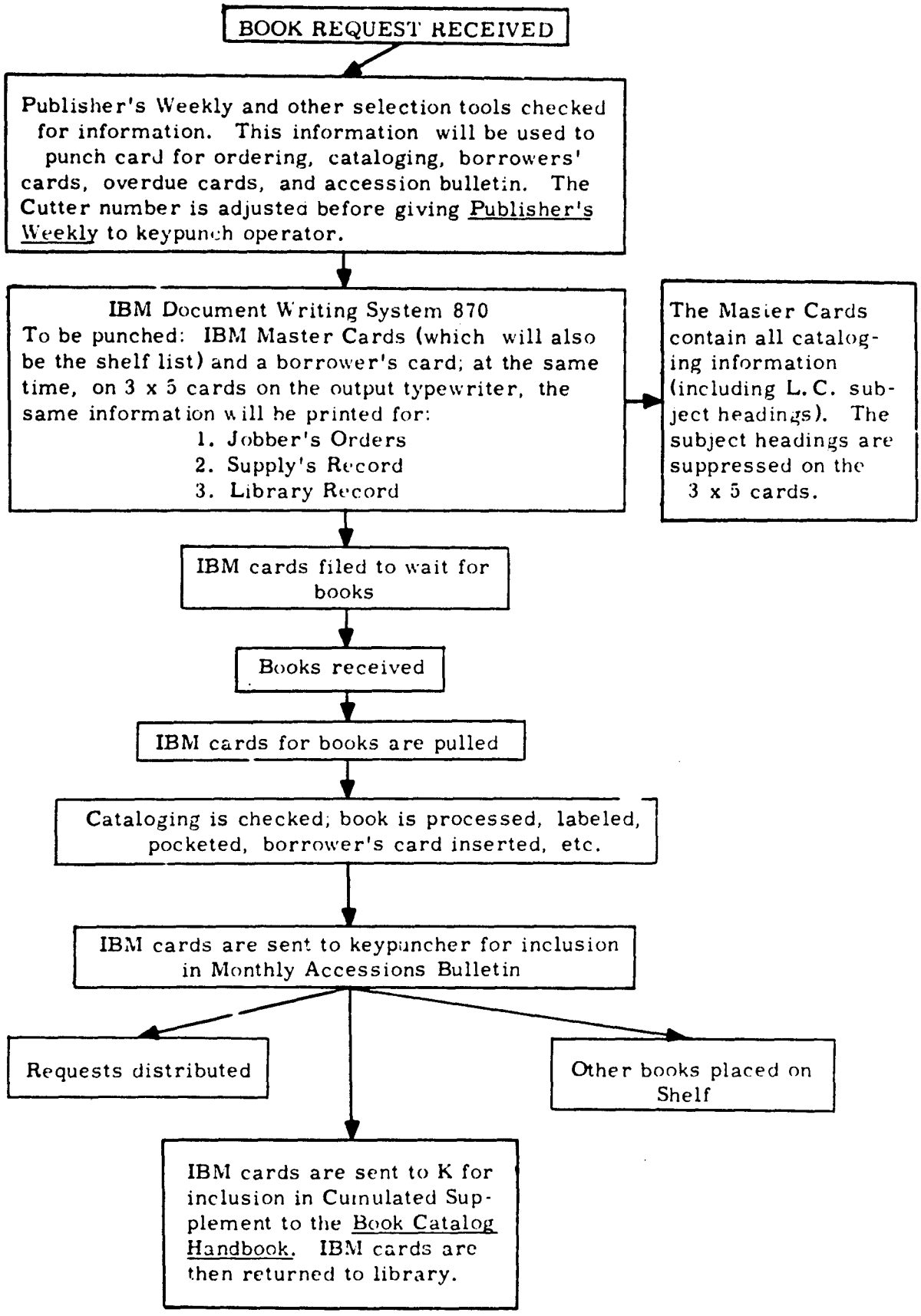
(5) Punched cards are filed to wait for books.

(6) Punched cards are pulled upon receipt of the book.

(7) Cataloging is checked; book is processed, labeled, and pocketed; and borrower's card is inserted.

Figure 3

Book Catalog Generation--
IBM 870, 7030 System



(8) Cards on items received are sent to keypuncher for inclusion in the Monthly Accessions Bulletin.

(9) Punched cards are sent to K Lab for inclusion in a Cumulated Supplement to the Book Catalog Handbook.

(10) Punched cards are then returned to MAL for file.

2. Outputs

(1) Acquisition printout (planned for the future; format not determined).

(2) Borrower's card (planned for the future; format not determined).

(3) Book Catalog Handbook. The book catalog will be issued annually, with cumulative monthly supplements. A permuted index will form part of the Handbook until the Library staff can assign descriptors.

4. MAJOR PROBLEMS

No major problems were faced in developing the original program, since support for the idea was apparent, funds were available, and the programming staff was most cooperative. The programming staff is being equally helpful in the conversion to the IBM 7030. Staff shortage has been holding up implementation.

III. PROGRAM SYSTEM DATA

1. MASTER FILE--IBM 7090 System

The Master File is ordered by accession number and contains one binary record for each document. Each binary record contains one hundred and eighteen 36-bit words. Each word or field of words is defined as shown in Figure 4.

2. PROGRAMS--IBM 7090 System (See Figure 5)

(1) File Establishment and Maintenance

1. Preparation of Input Tape

Input cards followed by a card with Z punched in columns 3 through 8 (to denote end of data) and an "end-of-file" card are put onto magnetic tape by means of a special 1401 card-to-tape program which also converts the letter O to a Zero. These cards do not have to be ordered. The tape is the B1 tape and must be prepared off line.

2. Runs

(1) Sort. The documents are sorted with accession number major, transaction code intermediate, and card code minor.

(2) Establishment or Update. The sorted input is used either to establish a Master File or to update an existent Master File. In establishing, a Master file is created; in updating, a new Master File is generated, and the old Master File is unaltered.

FIELD DEFINITION	WORD NO.	FIELD SIZE
Library Accession Number	1	6AN
Source	2-25	144AN
Title	26-61	216AN
Author	62-66	30AN
Date	67	6I
Classification	68	6AN
No. of Copies	69	2AN
Routing	70	6AN
Miscellaneous	71-73	18AN
Auxiliary No.	74-79	36AN
Contract No.	80-83	24AN
Descriptors	84	6AN
	.	.
	.	.
	.	.
	118	6AN

FIGURE 4

Library Master File Description

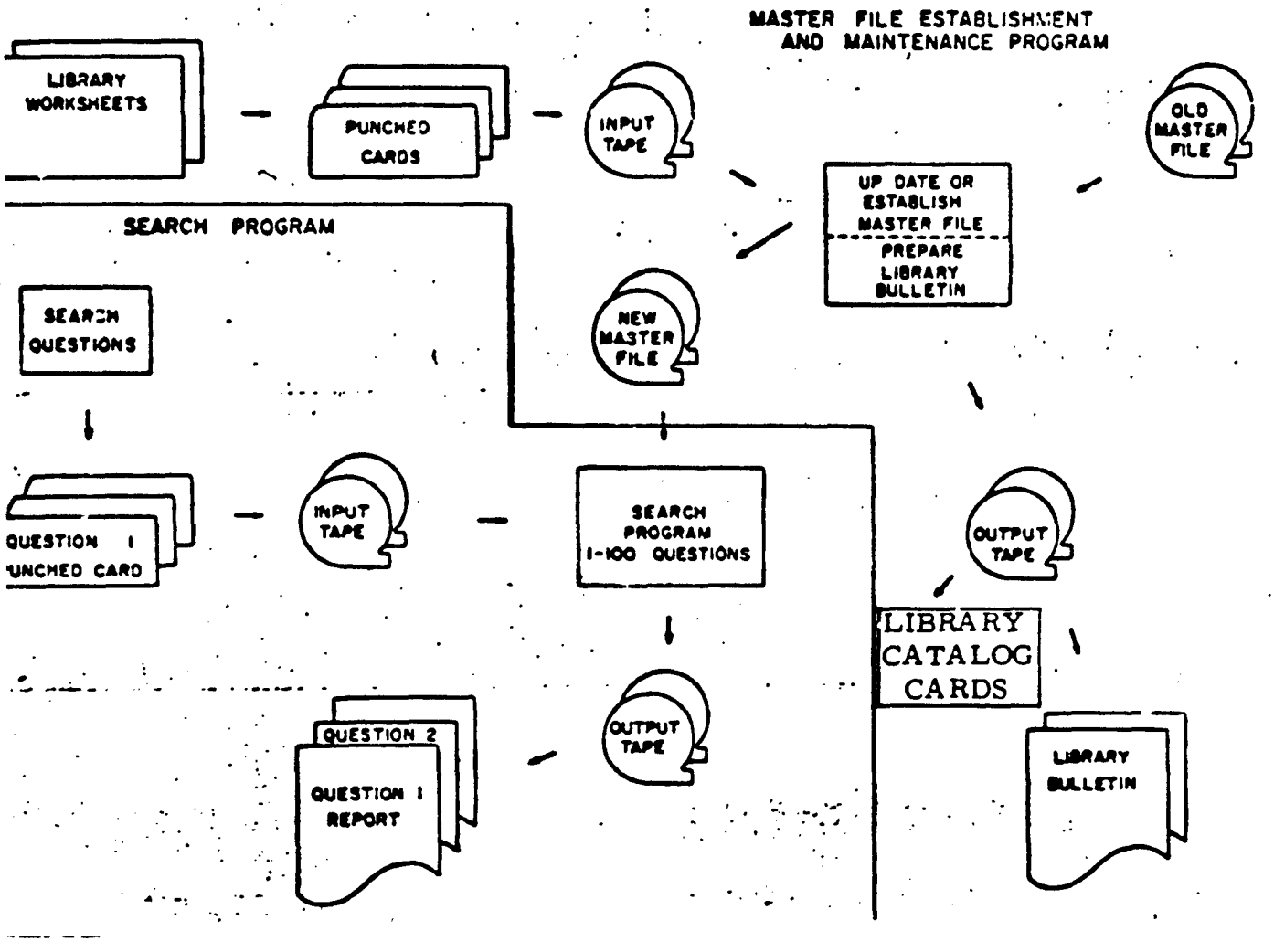


FIGURE 5

Flow Diagram--IBM 7090 Library Programs

Errors detected by the program in the input data are rejected, and an appropriate message is printed out on line so that the error(s) may be corrected and the data may be reentered in the next processing.

(2) Search

1. Preparation of Input Tape

Input cards are put onto magnetic tape in ascending order by question number, followed by a card with Z punched in columns 1-6 (to denote end of question) and an "end-of-file" card. The tape is the B1 tape and must be prepared off line.

2. Runs

(1) Search. This program scans the Master File for documents that satisfy the search questions. Each document record that meets the requirements is put onto an output tape along with the question number of the question it satisfies.

(2) Sort. The output tape from the search run is sorted on question number; i.e., the document records are ordered according to the question they answered.

(3) Print. The document records, along with their question numbers and the questions' descriptor codes, are put into a format similar to that of the Bulletin (see Appendix C-3).

3. FILES -- IBM 7030 System

(1) Master File

The Master File is ordered by accession number. Information for each report is entered in nine-word blocks with 64 bits per word. The number of nine-word blocks per report is variable; a nine-word block corresponds to one input card. The layout for a block follows:

Word 1-- card type and sequence number; 3 characters; bits 32-48

Word 2-- accession number; 6 characters; bits 14-49

Word 3-- Word 8--10 characters of information; first 60 bits

The tape record is 512 words. The nine-word blocks are arranged sequentially into 512-word tape records.

(2) Thesaurus File

The thesaurus file is ordered first on descriptor type with each type ordered alphabetically. Type 1 descriptors are entered in two-word blocks; type 2 descriptors in three-word blocks; type 3 descriptors in five-word blocks. The first word for all blocks contains only the descriptor type in one character occupying bits 44-49. The other word or words contain the descriptor using only the first 60 bits of the word. The layout is as follows:

	Type 1	Type 2	Type 3
Word 1	1	2	3
Word 2	The Descriptor	First ten characters of descriptor	
Word 3	-	The remainder of descriptor	Characters 11-20 of descriptor
Word 4	-		Characters 21-30 of descriptor
Word 5	-	-	The remainder of descriptor

4. PROGRAMS--IBM 7030 System

For flow chart of 7030 Library programs, see Figure 6.

(1) Thesaurus File Establishment and Maintenance

Input cards are sorted off line first on card type and then alphabetically within type. The cards are then loaded onto the input tape using the IBM 360 or IBM 1401.

The sorted input is used either to establish a Thesaurus File or to update an existent one. In establishing a Thesaurus File is created; in updating, a new Thesaurus File is generated, and the old file is unaltered.

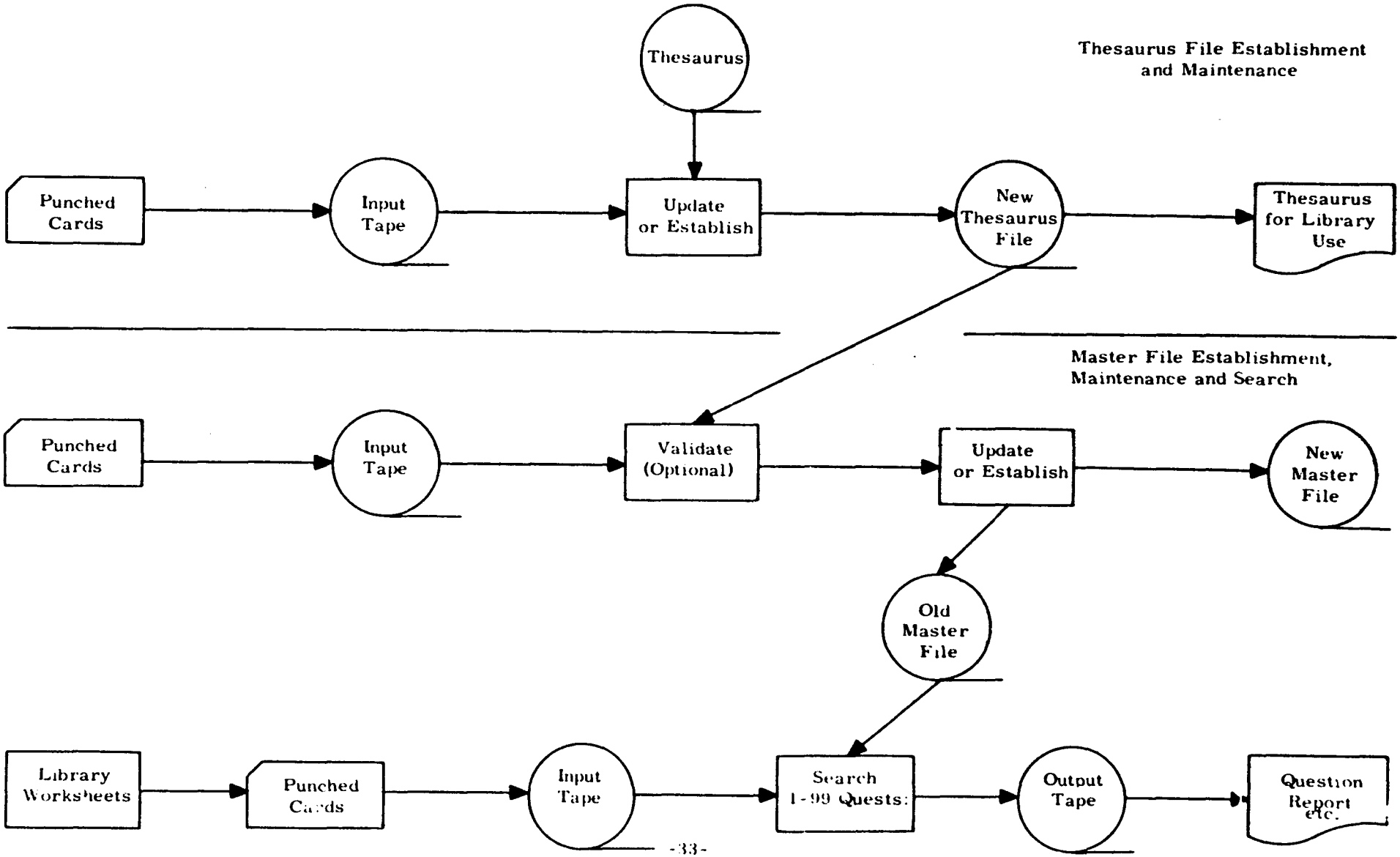
There are two transaction codes: Insert (I) and Delete (D). Establishment uses only the insert code; update uses both.

(2) Master File Establishment, Maintenance, and Search

The report file establishment, maintenance, and search programs are written in both FORTRAN and STRAP (STRETCH) Assembly Program), there being an approximate total of 2,399 FORTRAN statements and 5,358 STRAP.

FIGURE 6

Flow Diagram -- IBM 7030 Library Programs



There are four basic runs; in addition, for the sake of computing efficiency, the basic runs may be combined and run against the master tape during one pass of the tape to get several run configurations. Input cards for these runs are loaded onto an input tape using either the IBM 360 or IBM 1401.

1. Validate

The cards on the input tape may be in any order. Validate reads the cards in and sorts them by card type. Type 1, type 2, and type 3 cards (descriptor cards) are then compared with the Thesaurus File. Validate first compares all type 1 cards with the type 1 descriptors in the Thesaurus File; then the type 2 cards with the type 2 descriptors; and finally the type 3 cards with the type 3 descriptors. Any descriptor cards that do not match descriptors in the thesaurus are rejected.

2. Establish

In Establish, a new Master File is created. Cards are read in from the input tape, then sorted first by accession number and next by card type. For a document to be loaded, it is required that at least a type 4, type 5, and type 8 card be present.

3. Update

In Update, a new report file is generated, and the

old file is unaltered.

There are four transaction codes associated with Update. These are Enter (E), Delete (D), Replace (R), and Remove (Z). Cards are loaded from the input tape and sorted first by accession number, next by card type, and then by transaction code.

The Enter code is used in two conceptually different ways. The first way it is used is to enter a new document into the file, and this requires as a minimum a type 4, type 5, and type 8 card.

The second way is to enter new information about a document already in the file. Prior to entering such information (which can be of type 1, type 2, type 3, type 6, or type 7 only), checks are made for the presence of type 4, type 5, and type 8 information. If the latter types are present, no entry is made.

The Delete code is used to delete type 1, type 2, type 3, type 6, or type 7 card information only from information in the Master File about a particular document.

The Replace code is used when it is desirable to replace all information of a particular type for a given document. The Replace code is the only way to change

type 4, type 5, and type 8 information.

The Remove code is used to delete all information about a document from the report file.

4. Search

Search loads up to 99 questions with up to three cards per question from the input tape. It then reads all information about an accession number into a block and core. Each of the 99 questions is then compared with the descriptors for the document and, if the query conditions are satisfied, all the information about the document--plus the question numbers that it satisfies--are transferred to tape. All accession numbers are processed in sequence until the end of the file is reached. The file of accession number information and questions that the accession numbers satisfy are then sorted by question number and formatted onto another tape. This tape is transferred to the IBM 1401 or IBM 360 to have the results printed.

5. Run Configurations

The options for configurations of the four basic runs are: (1) Establish; (2) Update; (3) Search; (4) Validate, Update; (5) Validate, Update, Search; (6) Validate, Update,

Establish; (7) Update, Search.

It should be noted that material which is entered during a combination of Update and Search will not be reflected in the search results--the Search run looks only at the old report file and not at the updated information going into the new file being generated.

IV. EQUIPMENT AND COSTS

1. EQUIPMENT

The old system used the IBM 7090 and IBM 1401 plus auxiliary equipment.

The new system uses:

IBM 870

836 keypunch with matrix typewriter

082 sorter (to be added later)

IBM 7030

7030 with 48K memory

2 million-word disk storage

8 tape drives

high-speed printer

An IBM 1401 - and later, and IBM 360 - are used for card to tape and tape to printer operations.

2. COSTS

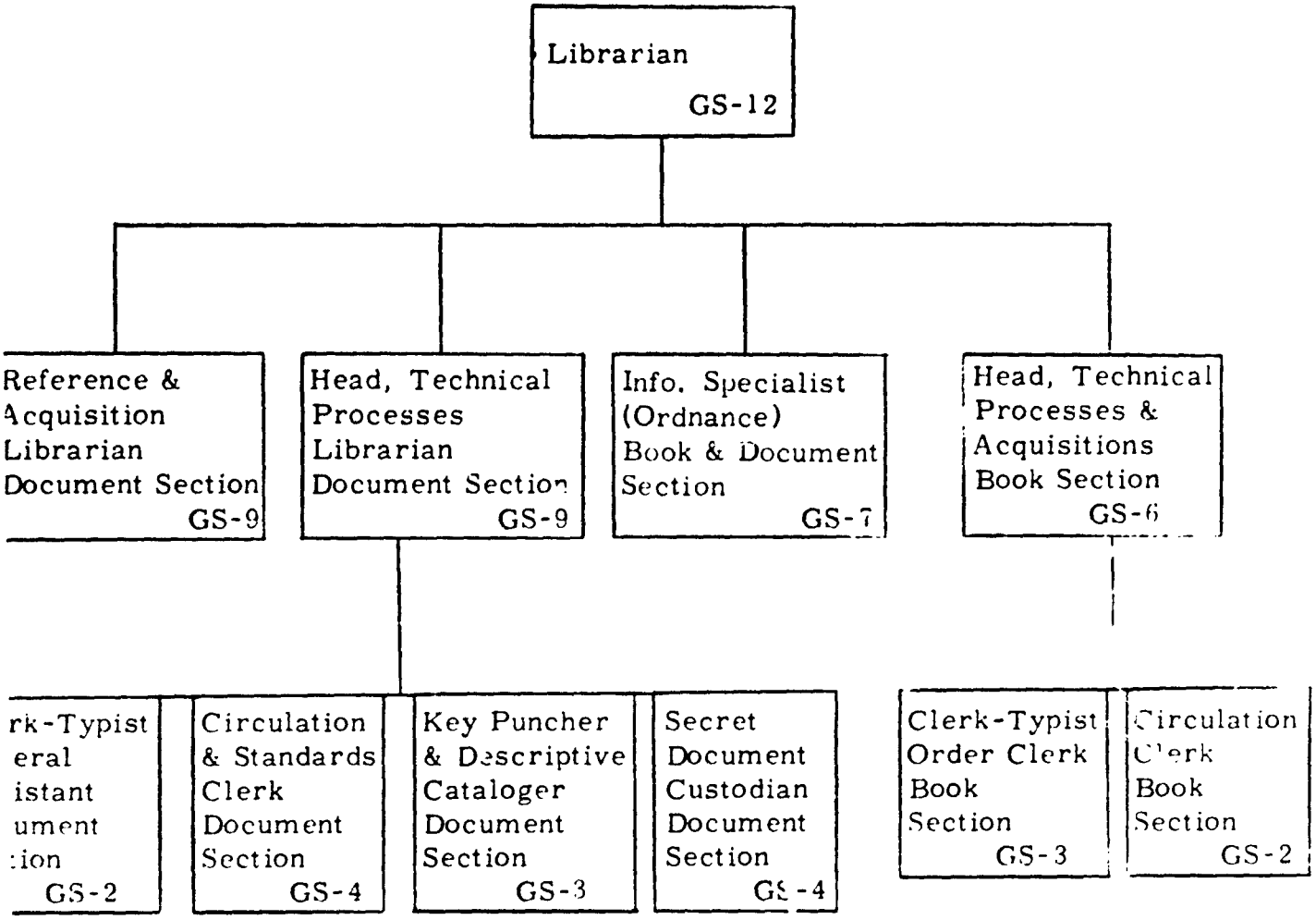
Under the old (7090) system, the Technical Library spent $2 processing each item. With the new (870, 7030) system, the Library spends $3.50 processing each item. (The rise in cost resulted from the Library's taking over keypunching.) The K Lab spent $3.50 on each search under the old system; the cost is the same with the new system. Costs of K Lab processing under the old

and new systems are not given as keypunching was done by the K Lab under the old system but not under the new.

APPENDIX A

ORGANIZATION OF THE TECHNICAL LIBRARY AND ITS ACTIVITIES

NAVAL WEAPONS LABORATORY TECHNICAL LIBRARY



APPENDIX B

FILE ESTABLISHMENT AND MAINTENANCE--IBM 7090 SYSTEM

SECURITY CLASSIFICATION _____

CARD 1	TRANS. 2	LIBRARY ACCESSION NUMBER 3–8											
1		SOURCE ABBREVIATION 9–26		REPORT NUMBER 27–44		SOURCE 45–80							
2		SOURCE 9–80											
3		TITLE 9–80											
4		TITLE 9–80											
5		TITLE 9–80											
6		AUTHOR 9–38		DATE 39–44		CLASS. 45–50		NO. 51–56		ROUTING 57–62		MISCELLANEOUS 63–80	
7		AUXILIARY NUMBER 9–44				CONTRACT NUMBER 45–68							
8		DESCRIPTOR	CODE 9–14	DESCRIPTOR	CODE 9–14	DESCRIPTOR	CODE 9–14						
			15–20		15–20		15–20						
			21–26		21–26		21–26						
			27–32		27–32		27–32						
			33–38		33–38		33–38						
			39–44		39–44		39–44						
			45–50		45–50		45–50						
			51–56		51–56		51–56						
			57–62		57–62		57–62						
			63–68		63–68		63–68						
			69–74		69–74		69–74						
			75–80		75–80								

SECURITY CLASSIFICATION _____

Keypunch Instructions for

Library Document Indexing Worksheet

PRNC-NWL - 3070/13 (Rev. 7-62)

GENERAL INSTRUCTIONS: Punch card only if it contains data.
Left Adjust all information in specified fields.
Any Alpha "O" may be punched as zero.

Cols.	Data
1	Card Code - Cards are numbered 1 through 8. Punch number as entered if the card contains other data.
	Card 1 - First source card. Punch it full before beginning Card 2.
	Card 2 - Second source card.
	Card 3 - First title card. Punch it full before beginning card 4.
	Card 4 - Second title card. Punch it full before beginning Card 5.
	Card 5 - Third title card.

In cards #2, 4, and 5, space in col. 9 if full word ended in col. 80 of pervious card.

	Card 6 - Author, date, classification, number of copies, routing, and miscellaneous data. Left adjust all fields.
	In the date and classification fields, do not punch hyphens. Punch a 4-digit date. Date example: 2-62, keypunch 0262 Classification example: C-4, keypunch C4. If nothing is entered in the classification field, keypunch "U".
	Card 7 - Auxiliary number and contract number.
	Card 8 - Descriptor card. All descriptor cards have an 8 punched in col. 1, and there may be 3 descriptor cards per document with a maximum of 12 descriptors on the first two cards and 11 descriptors on the third card. Left adjust all fields.
2	'D", 'E' or R for cards 1-7 and "D", 'R", or X', Y', Z" for card 8. If nothing is entered on cards 1-7 punch "E". If nothing is entered on the 8 cards, punch 'X in the first, Y' in the second, and "Z' in the third.

3-8 Library Call Number. The Library Call Number is keypunched in all cards.

NOTE: Cols. 3-8 will be the same for all cards punched for each document.

9-80 Keypunch data shown in cols. as indicated in each block.

Computer Operating Procedures - File Establishment & Maintenance

1. Tape Setup

   A1 - Fortran System tape.

   A2 - Program tape.

   A4 & A5 - Scratch tapes.

   B1 - Input tape (data). If updating, replace the input tape with the old master file tape after sorting is completed.

   B2 & B3 - Scratch tapes.

   B5 - Assigned tape (at end of run will be the new master file tape).

2. Operating Procedures

   a. Clear memory and reset all keys to up.

   b. Load cards.

After sorting is completed, a halt will occur before file processing is begun. At this time sense switch settings, if any, should be made.

Sense switches are employed to determine what type of file processing is to occur -- establishment or update -- and whether or not the "Bulletin" is to be produced.

Sense switch 1	down	-- Does not produce "Bulletin"
Sense switch 1	up	-- Produces "Bulletin." ("Secret" document descriptors and titles are masked unless sense switches 2 and 5 are set.)
Sense switch 2	down	-- Prints out all "Secret" document descriptor codes in the "Bulletin"
Sense switch 2	up	-- Prints out only the first four descriptor codes of "Secret" documents in the "Bulletin."

Sense switch 3		-- Not used.
Sense switch 4	down	-- Establishes master file.
Sense switch 4	up	-- Updates master file.
Sense switch 5	down	-- Prints out "Secret" titles of "Secret" documents in the "Bulletin."
Sense switch 5	up	-- "SECRET TITLE" is printed in the "Bulletin" instead of the actual classified titles of "SECRET" documents.
Sense switch 6		-- Not used.

To begin file processing, push the "START" button on the computer console.

At the end of the run, the new master file tape and the old master file tape (if updating) will rewind and unload. The two output tapes for the "Bulletin", one with the classified report and one with the unclassified report, will rewind and unload only if the option to produce the "Bulletin" was taken. The "Bulletin" report tape drive numbers will be listed on line.

The 03 tape is the new master file tape and should be "file protected" for later use with the Search Program and for the next updating.

NAVC	NAVAL AIR ENGINEERING FACILITY ØR LAB., NAVAL AIR MATERIAL CENTER
NANS	NANØSECØND
NARB	NARRØW BAND
NARE	NAREC (CØMPUTER CØDE)
NARR	NARRØW
NASA	NATIØNAL AERØNAUTICS + SPACE ADMINISTRATIØN
NASW	NAVAL WEAPØNS EVALUATIØN FACILITY
NATE	NAVAL AIR TEST CENTER
NATI	NATIØNAL
NATR	NATURAL
NAUT	NAUTILUS (USS)
NAVA	NAVAL, NAVY
NAVE	NAVIER-STØKES
NAVG	NAVIGATIØN
NAVI	NAVIGATIØN SYSTEMS
NAZZ	NA
NBCW	NB(CHEMICAL WARFARE AGENT)
NBST	NATIØNAL BUREAU ØF STANDARDS
NCRE	NAVAL CØNSTRUCTIØN RESEARCH ESTAB., GT. BRIT.
NCSC	NØRTH CARØLINA STATE U.
NCZZ	NC
NDNE	NØNDESTRUCTIVE
NDRC	NATIØNAL DEFENSE RESEARCH CØMMITTEE
NEED	NEEDLES
NEES	NAVAL ENGINEERING EXPERIMENT STATIØN
NEFL	NEAR FIELD
NEGA	NEGATIVE, NEGATIØN
NELA	NAVY ELECTRØNICS LAB.
NEØN	NEØN
NEØP	NEØPRENE
NEPT	NEPTUNIUM
NERG	NERVE GAS
NERØ	NERVØUS
NERV	NERVES, NEURAL, NEURØ
NETH	DUTCH

B-4

Sample Page from Dictionary of Codes
in Use with Descriptors

Search Result

[illegible]

[illegible] NAVAL AIR ST

[illegible]

FINAL REPORT ON TASK I: BALLISTIC WIND AND DENSITY

[illegible] 0454 U

[illegible]

[illegible] KB

[illegible] WIND DENS FIRE SURA

[illegible]

[illegible] WHITE SANDS

[illegible] ELECTRONICS RESEARCH & DEV. ACTIV

[illegible]

[illegible] VARIABILITY AND ITS EFFECT ON ROCKET IMPACT PREDICTION

[illegible] 0163 U

[illegible] VART ROKR IMPC PRED TARG CLIM

[illegible]

[illegible] RAND CORP. S

[illegible]

[illegible] SHIELDING

[illegible]

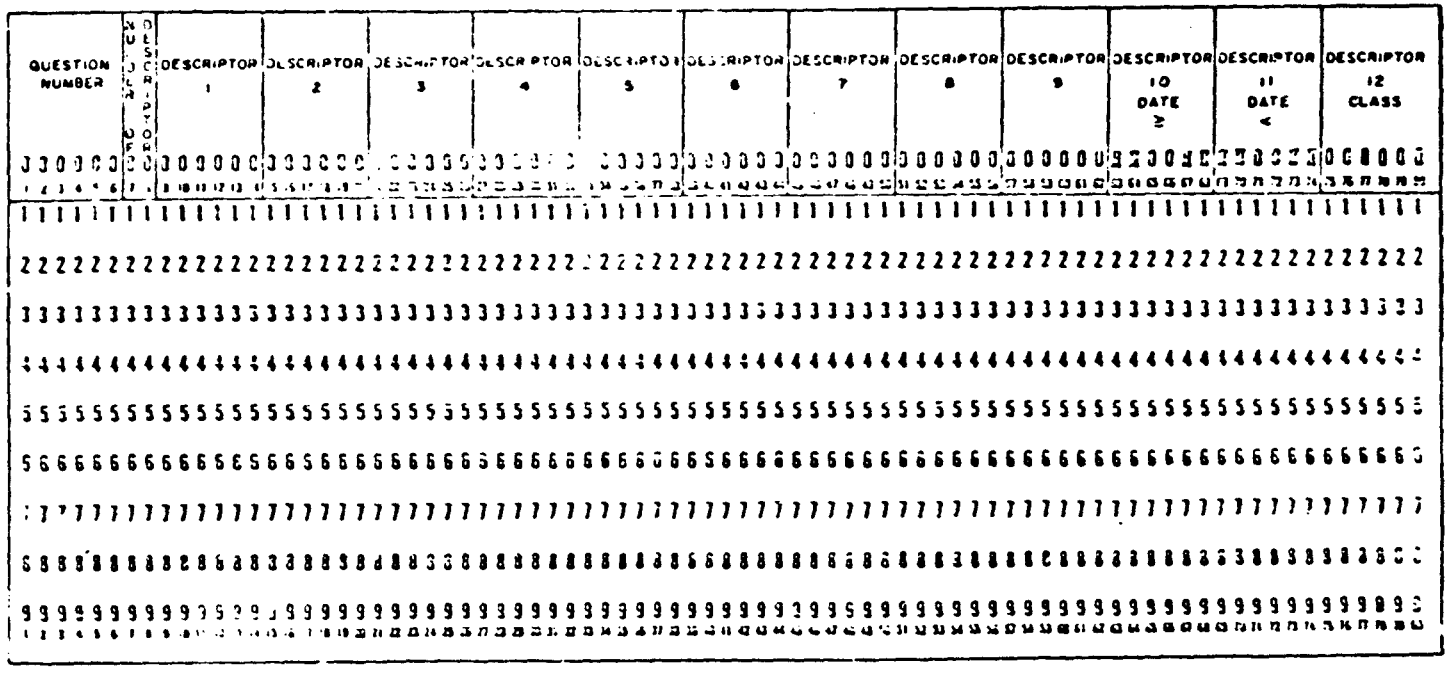
[illegible] 0452 U

[illegible]

APPENDIX C

SEARCH -- IBM 7090 SYSTEM

LIBRARY SEARCH QUESTION FORMAT



Computer Operating Procedures - Search

1. Tape Setup

A1 - Fortran System tape.

A2 - Program tape.

A3 & A4 - Scratch tapes.

A5 - Master File tape.

B1 - Input tape (questions).

B2 & B3 - Scratch tapes.

B5 - Scratch tape (final output will be on this tape).

2. Operating Procedures

a. Clear memory and reset all keys to up.

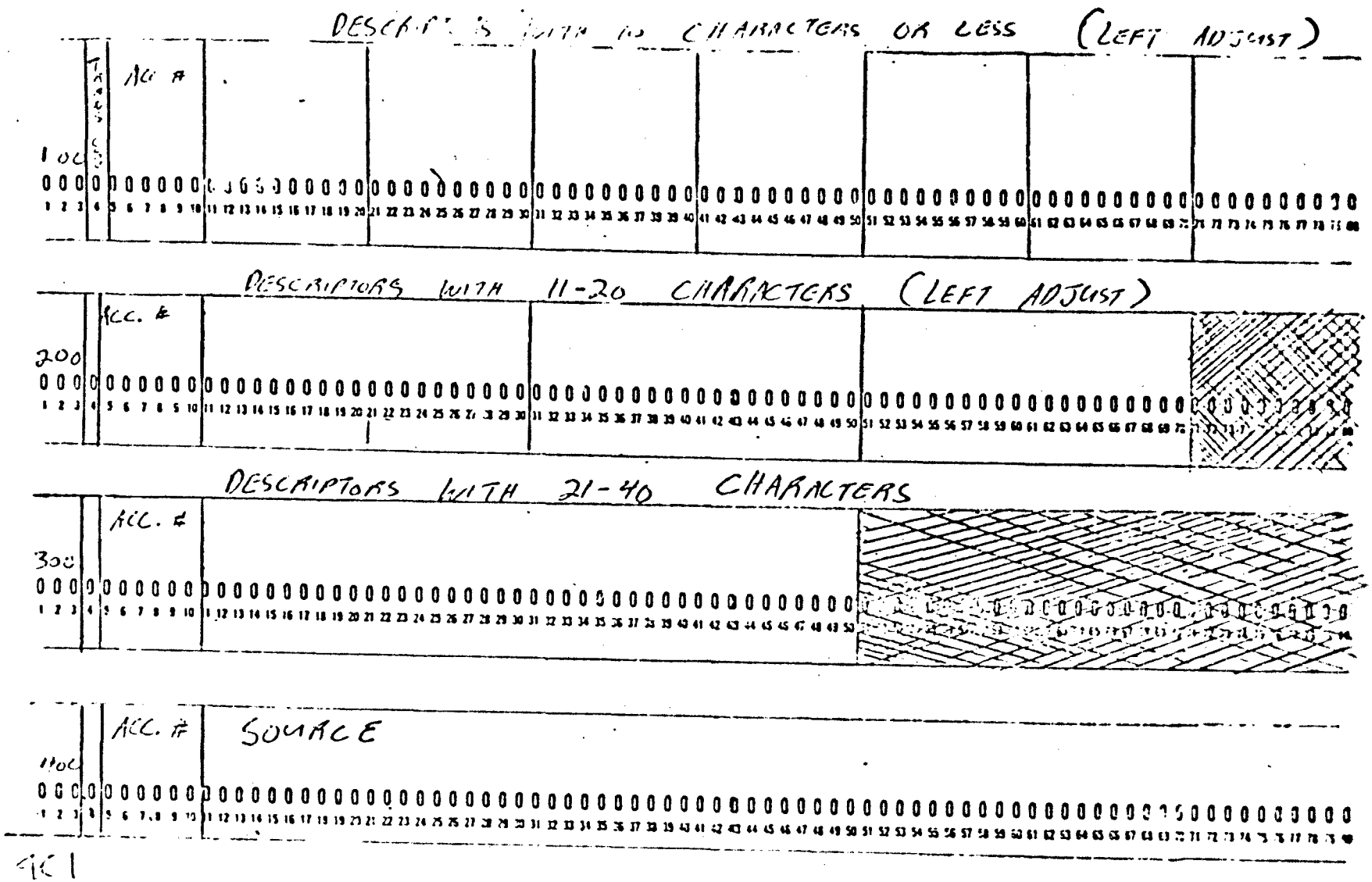
b. Load cards.

After sorting is completed, a halt will occur so that the master file tape can be replaced by a scratch tape. Resume operations by pushing the "START" button on the computer console.

At the end of the run, the output tape - B5 - will rewind and unload.

APPENDIX D

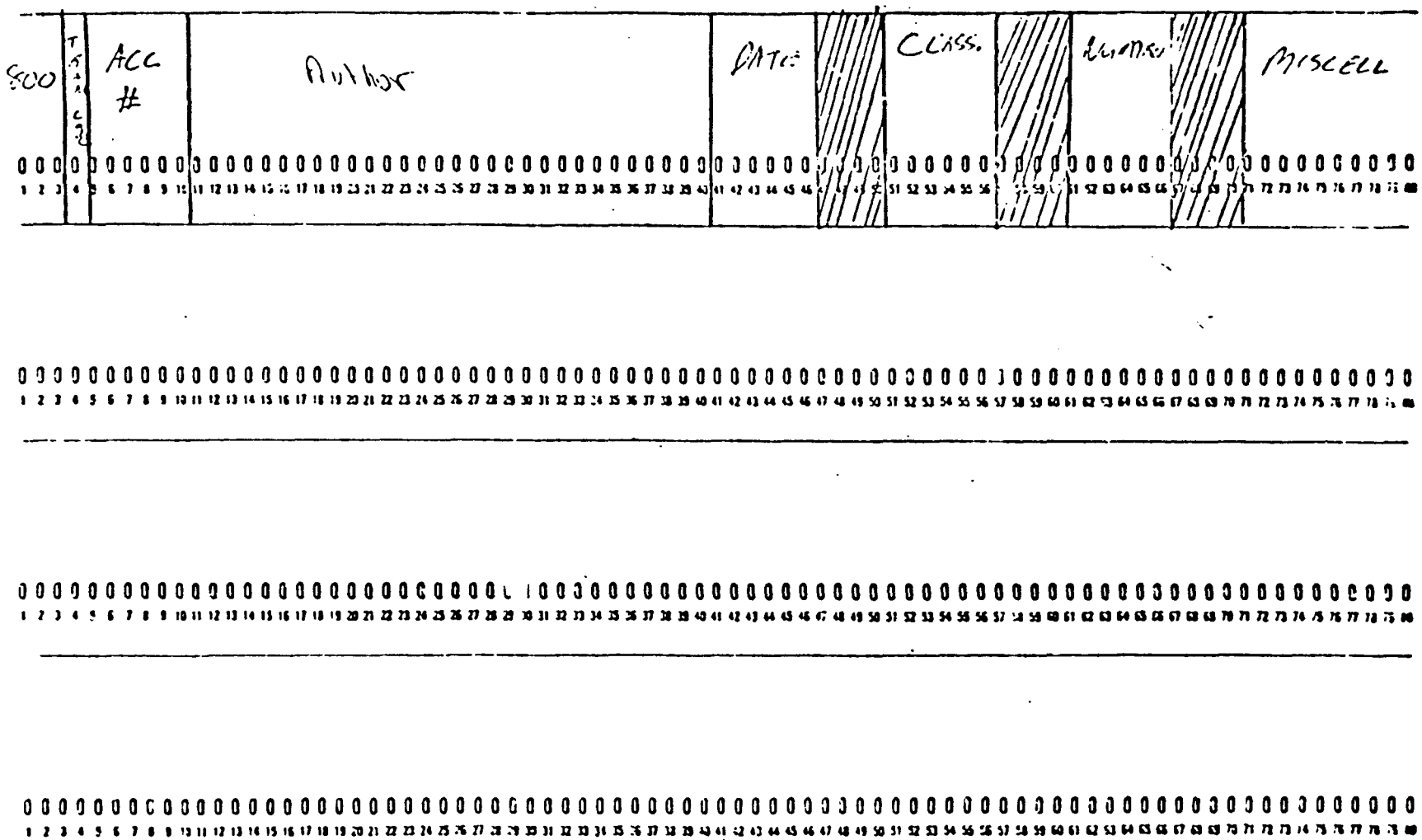
MASTER FILE ESTABLISHMENT AND MAINTENANCE--
IBM 870, 7030 SYSTEM



Descriptor Card Punching Format

D-1 (Cont.)

IC-NWL-10462/113



APPENDIX E

SEARCH -- IBM 870, 7030 SYSTEM

NWL TECHNICAL LIBRARY
DOCUMENT SECTION
LITERATURE SEARCH REQUEST

REQUESTOR John Spencer EXT. 988
REFERENCE LIBRARIAN Cel EXT. 603
DATE 6/18/65

QUESTION

Air Blast Pressure
Control of blast

War Heads
Continuous Rod
Projectiles
Bombs

Buffering--Continuous Warheads
Altenuations
Reduce peak over pressure

Maintain impulse to explosively project fragements (reduces spike) initial peaks while redusing initial peaks.

Explosion impulse correlation with pressure

Staged Warheads

DESCRIPTORS

1. Air
   Blast
2. Control
   Blast
   Pressure
3. Continuous rod
   Warheads
   Pressure
4. Projectiles
   Pressure
5. Bombs
   Pressure
6. Buffering
7. Warheads
   Attenuation
8. Peak
   Pressure

E-1
Search Request Form

QUESTION: DETECTION OF HYDROGEN LEAKAGE. 2 February 196[illegible]

024464
AIR FORCE. AERO PROPULSION LABORATORY.
A PORTABLE HYROGEN FIRE DETECTOR.

T.M.TRUMBLE. ND /U/

THE PROBLEM OF TIMELY DETECTION OF SMALL HYDROGEN AIR DIFFUSION FLAMES AT MANUFACTURING, STORAGE AND USING FACILITIES IS IMPORTANT. SMALL AND INVISIBLE TO THE EYE, THESE FLAMES REPRESENT NOT ONLY A PERSONNEL HAZARD, BUT WHAT IS MORE IMPORTANT, THEY REPRESENT AN IGNITION HAZARD.

HYDROGEN/FIRE/DETECTION/AIR/DIFFUSION/RADIATION/FLAMES/IGNITION/SAFETY/ GUIDED/MISSILE/ULTRAVIOLET /GASES

024463
MARTIN COMPANY
THE PHENOMENON OF A TIME LAPSE EFFECT IN PREDICTION AND DETECTION OF LEAKS.

G.F.HERBST ND /U/

LEAK DETETCION TESTING PERFORMED ON SUCH ITEMS AS GASKETED FLANGE JOINTS AND DOUBLE WALL FLEXIBLE BELLOWS HAS INDICATED THAT A DEFINITE TIME LAPSE MAY OCCUR BETWEEN THE TIME OF PRESSURIZATION AND SUFFICIENT FLOW OF GAS OR FLUID THROUGH THE LEAK TO INSURE DETECTION. THIS TIME LAPSE COULD OCCUR IN ANY CASE WHERE THERE IS, IN EFFECT, AN INTERMEDIATE VOID OR CHAMBER SOMEWHERE IN THE TOTAL LEAK PATH. THIS PAPERSGIVES A STATEMENT AND ANEXPLANATION OF THE PROBLEM.

TIME/DELAY/PREDICTION/DETECTION/LEAKS/CAPILLARY/FLOW/PRESSURE/EQUATIONS TANKS/DIFFERENTIAL/HELIUM/HYDROGEN/GASES

024462
GENERAL DYNAMICS. ASTRONAUTICS
DEVELOPMENT OF CENTAUR HYDROGEN SYSTEM FLUID CONNECTORS.PRESENTED AT AF INDUSTRY CONFERENCE, LOS ANGELES, CALIFORNIA. 26 FEB. 1965.

L.A.HAGLOCH 0265 /U/

THIS PAPER DESCRIBES THE DEVELOPMENT PROGRAM CONDUCTED AT GENERAL DYNAMICS/ ASTRONAUTICS TO PERFECT EFFECTIVE LIQUID HYDROGEN SYSTEM CONNECTOR FOR THE WORLD'S FIRST SUCCESSFUL HYDROGEN-FUELED SPACE VEHICLE, THE CENTAUR.

CENTAUR/HYDROGEN/FLUID/CONNECTORS/LEAKS/DETECTION/FUEL/SPACE VEHICLES/

PRINTOUT FORM FOR THE DOCUMENT SECTION OF THE TECHNICAL LIBRARY, U.S. NAVAL WEAPONS LABORATORY, DAHLGREN, VA.

Sample Search Results

Unclassified

Security Classification

DOCUMENT CONTROL DATA R&D

BOOZ ALLEN APPLIED RESEARCH, INC. 4733 Bethesda Avenue Bethesda, Maryland 20014	Unclassified

REPORT TITLE

Mechanization Study of the Technical Library, U.S. Naval Weapons Laboratory, Dahlgren, Virginia

DESCRIPTIVE NOTES (Type of report and inclusive dates)

Final Report of on-site survey

AUTHOR(S) (Last name, first name, initial)

G. A. Kershaw, D. Crowder, J. E. Davis, E. G. Loges, E. Merendini, S. M. Thomas

REPORT DATE	TOTAL NO. OF PAGES	NO. OF REFS
September, 1966	66	0

CONTRACT OR GRANT NO.	ORIGINATOR'S REPORT NUMBER(S)
DSA-7-15489	914-1-24
PROJECT NO.	OTHER REPORT NO(S) (Any other numbers that may be assigned this report)
	AD 640 119

AVAILABILITY/LIMITATION NOTICES

Distribution of this Document is unlimited

SUPPLEMENTARY NOTES	SPONSORING MILITARY ACTIVITY
None	Defense Supply Agency Defense Documentation Center Cameron Station, Virginia

ABSTRACT

The Naval Weapons Laboratory (NWL) Technical Library is redeveloping a mechanized system that uses the IBM 7090 and 1401 computers for the IBM 870 Document Writing System and the IBM 7030 computer (STRETCH). Mechanized processes in the IBM 7090 System provide for the establishment and maintenance of a master file for reports and the search of this file to satisfy requests from Library users. The 870, 7030 System is expected to increase the timeliness of accession bulletins and catalog cards, increase the efficiency of Library procedures (Descriptive cataloging, Typing, and keypunch are combined into one step), and give the Library more control over procedures(e.g., punched cards instead of worksheets will be sent to computer operations, and generation of accessions bulletins and catalog cards will no longer involve computer operations).

DD FORM 1473

Security Classification

14 KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
Automation Digital Computers Electronic Accounting Machines Libraries						

INSTRUCTIONS

1. ORIGINATING ACTIVITY: Enter the name and address of the contractor, subcontractor, grantee, Department of Defense activity or other organization (corporate author) issuing the report.

2a. REPORT SECURITY CLASSIFICATION: Enter the overall security classification of the report. Indicate whether "Restricted Data" is included. Marking is to be in accordance with appropriate security regulations.

2b. GROUP: Automatic downgrading is specified in DoD Directive 5200.10 and Armed Forces Industrial Manual. Enter the group number. Also, when applicable, show that optional markings have been used for Group 3 and Group 4 as authorized.

3. REPORT TITLE: Enter the complete report title in all capital letters. Titles in all cases should be unclassified. If a meaningful title cannot be selected without classification, show title classification in all capitals in parenthesis immediately following the title.

4. DESCRIPTIVE NOTES: If appropriate, enter the type of report, e.g., interim, progress, summary, annual, or final. Give the inclusive dates when a specific reporting period is covered.

5. AUTHOR(S): Enter the name(s) of author(s) as shown on or in the report. Enter last name, first name, middle initial. If military, show rank and branch of service. The name of the principal author is an absolute minimum requirement.

6. REPORT DATE: Enter the date of the report as day, month, year, or month, year. If more than one date appears on the report, use date of publication.

7a. TOTAL NUMBER OF PAGES: The total page count should follow normal pagination procedures, i.e., enter the number of pages containing information.

7b. NUMBER OF REFERENCES: Enter the total number of references cited in the report.

8a. CONTRACT OR GRANT NUMBER: If appropriate, enter the applicable number of the contract or grant under which the report was written.

8b, 8c, & 8d. PROJECT NUMBER: Enter the appropriate military department identification, such as project number, subproject number, system numbers, task number, etc.

9a. ORIGINATOR'S REPORT NUMBER: Enter the official report number by which the document will be identified and controlled by the originating activity. This number must be unique to this report.

9b. OTHER REPORT NUMBER(S): If the report has been assigned any other report numbers (either by the originator or by the sponsor), also enter this number(s).

10. AVAILABILITY/LIMITATION NOTICES: Enter any limitations on further dissemination of the report, other than those imposed by security classification, using standard statements such as:

(1) "Qualified requesters may obtain copies of this report from DDC."

(2) "Foreign announcement and dissemination of this report by DDC is not authorized."

(3) "U. S. Government agencies may obtain copies of this report directly from DDC. Other qualified DDC users shall request through

"

(4) "U. S. military agencies may obtain copies of this report directly from DDC. Other qualified users shall request through

"

(5) "All distribution of this report is controlled. Qualified DDC users shall request through

"

If the report has been furnished to the Office of Technical Services, Department of Commerce, for sale to the public, indicate this fact and enter the price, if known.

11. SUPPLEMENTARY NOTES: Use for additional explanatory notes.

12. SPONSORING MILITARY ACTIVITY: Enter the name of the departmental project office or laboratory sponsoring (paying for) the research and development. Include address.

13. ABSTRACT: Enter an abstract giving a brief and factual summary of the document indicative of the report, even though it may also appear elsewhere in the body of the technical report. If additional space is required, a continuation sheet shall be attached.

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